



Course Title: Stochastic Processes العمليات العشوائية ثالثة حاسبات
Date: November 5, 2016 (Midterm Exam, First Term)

Course Code: CCE3117 3rd year
Time Allowed: 1 hr No. of Pages: 1

Answer the following two questions:

Question 1

(10 marks)

1. If A and B are independent events, prove that A^c and B^c are independent.
2. Let A and B be events with $P(A) = 1/2$, $P(B) = 1/3$ and $P(A \cap B) = 1/4$.
Find: i- $P(A|B)$, ii- $P(B|A)$, iii- $P(A \cup B)$, iv- $P(A^c|B^c)$, v- $P(B^c|A^c)$
3. If x be a continuous random variable with the probability
$$P(x) = kx \quad 0 \leq x \leq 2, \text{ and zero elsewhere,}$$

find the cumulative distribution function, mean, variance, and standard deviation of x.
4. Given a and b as constants, develop an expression for i - $E(a)$ and ii - $\text{Var}(aX + b)$
where X is a continuous random variable.

Question 2

(10 marks)

- a. When a die is tossed, the probability of the number appearing is proportional to the number itself.

Let A: {even number}, B: {prime number}, C: {odd number}.

1. Find the probability of each sample point of the sample space.
2. Find $P(A)$, $P(B)$, and $P(C)$.
3. Find the probability that:

- i. An even or prime number appears.
- ii. An odd prime number appears.
- iii. An even number but not prime number appears.

$$\frac{1/6}{1/6} \frac{P(E \cap P)}{P(E \cup P)}$$

- b. The students in a class are selected at random one after the other. Find the probability that the boys and girls in the class are alternates if the class consists of 4 boys and 3 girls; the first student must be a boy.

$$\frac{1}{35}$$

- c. Box A contains 8 items of which 3 are defective, and box B contains 5 items of which 2 are defective. Two items, one from each box, are drawn at random.

1. What is the probability that both items are not defective?
2. What is the probability that one of the items is defective and the other is not?

3. If one item is defective and the other is not, what is the probability that the defective item comes from box A?

Best wishes

Handwritten signature/initials

Handwritten signature/initials